

FOREST PRODUCTS

Project Fact Sheet

DECONTAMINATION OF PROCESS STREAMS THROUGH ELECTROHYDRAULIC DISCHARGE

BENEFITS

- Increases brightness
- Reduces need for bleaching and agglomeration chemicals
- Minimizes downtime
- Improves product quality
- Saves 53 million kWh per unit per year of electricity
- Offers negligible installation cost

APPLICATIONS

Approximately 1,500 electrohydraulic discharge units are in operation in this country today. The technology could be applied in each of these units with minimal capital, operational, and installation costs. There is no competing technology; commercialization of this application is expected in 2003, with market saturation within 7 years.

UNDERWATER SPARKER TECHNOLOGY COULD IMPROVE CONTAMINANT REMOVAL IN RECYCLED-PULP MILLS

Pulp and paper mills using recycled feedstock spend up to \$500,000 annually in stickies-control chemicals to remove glues, inks, and other contaminants from the process stream. Despite this treatment, a significant number of stickies remain on the pulp, further increasing production costs. Downtime is spent on felt cleaning, and felt life is reduced. Moreover, the brightness of the paper produced is diminished by the presence of these contaminants.

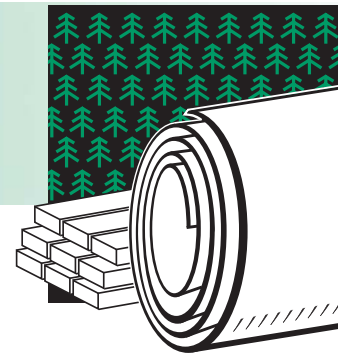
Experiments carried out by the Institute of Paper Science and Technology (IPST) have shown that discharging a 3-kV, 50-kA underwater spark over a period of 50 to 100 milliseconds “detackifies” the stickies present in the waste stream. The spark creates a sound wave that generates small quantities of hydroxyl radicals from the water. These hydroxyl species oxidize and detackify the surface of both stickies and pitch, particularly when the contaminants are present at low concentrations over a large volume. IPST has developed, patented, and commercialized the process, but unexpected and undesirable side-effects on the system have been observed during full-scale trials at several newsprint mills. A solid amalgam of fiber debris, inorganics such as clay, and stickies/pitch has separated from the stream during the firing, plugging the machine cleaners. The results suggest that shear may be involved, but researchers acknowledge that they require a more complete understanding of how the discharged spark induces contaminant removal and increases pulp brightness so these effects can be better predicted and controlled.

IPST will work with a number of industrial collaborators to establish the ability of the electrohydraulic discharge technology to decontaminate pulp mill processing streams for the secondary fiber industry. Commercialization of the new system will significantly reduce the industry’s expenditures for energy and chemicals and enhance the quality of its paper products.

FIGURE 1.



Bubble formation in water upon electrohydraulic discharge.



Project Description

Goal: To gain more insight into how the new sparker technology induces contaminant removal and increases brightness, so that its effects can be maximized and controlled.

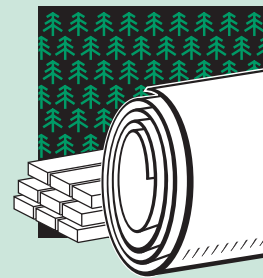
The first objective is to develop a fundamental understanding of how the sparker influences the behavior and interactions of various components present in process streams, so that the effect of sparking can be predicted in a mill situation. The next step is to test this understanding of the process in mills where the sparker can be run continuously. The third and main objective is to decontaminate the process streams at a mill (such as Augusta) in a controlled and predictable manner.

Sparking may form new carboxylic groups, which could participate in complexation processes, causing them to destabilize and drop out of solution. Project partners will subject fiber (both bleached and unbleached) to up to a few hundreds sparks, and then (a) measure the carboxylic acid content and (b) determine the number of new hydrogen bonding sites created by hydrogen-deuterium exchange.

The zeta potential and surface chemistry of clay will be determined as a function of spark rate. Previous work showed that the sparker increased the screenability of stickies, possibly due to the oxidation of the stickie surface making them less malleable and inhibiting their extrusion through screens. These effects will be quantified by preparing a suspension of stickies (polyvinyl acetate, acrylates, and mixtures thereof) and measuring the particle size distribution before and after screening. The size fraction just above the slot width would be expected to deform and squeeze through the slots. If sparking makes the stickies less malleable, this size fraction should be rejected.

Progress & Milestones

- The technology has been demonstrated in full-scale trials at several mills.
- One mill, Visy Paper, has purchased the unit.
- In year 1, the fundamental laboratory-based aspects of the project will be completed.
- In year 2, the system will be tested in mills that have experience with the sparker. The project will continue *only* if the mill results can be understood and situations that could disrupt operations (such as plugging of screens and cleaners) can be understood and predicted.
- In year 3, full-scale trial runs will be conducted in mills where disruptions have occurred, along with a run in one additional mill.



PROJECT PARTNERS

Institute of Paper Science & Technology

Bowater

Augusta Newsprint Company

Eka Chemicals

Visy Paper

Georgia-Pacific Corporation

Electric Power Research Institute

Recycled Paperboard Technical Association

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